

A

WATER POLLUTION CONTROL
STATUS REPORT

STEEL MANUFACTURING
AND
PROCESSING OPERATIONS
IN THE
PROVINCE OF ONTARIO

July 1979

TD
428
M3
057
1979



Ministry
of the
Environment

The Honourable
Harry C. Parrott, D.D.S.
Minister

Graham W. S. Scott,
Deputy Minister

TD
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INTRODUCTION

The intent of this report is to bring together all pertinent environmental data on the control of water pollution in the iron and steel industry of Ontario. The report covers integrated steel plants, non-integrated steel plants, and rolling mills. All other iron and steel-related industries such as foundries are excluded.

There are nine active operations in the Province of Ontario which fall into the above categories. They produce and process a total of approximately 13,000,000 tons per year of iron and steel.

The companies are:

(A) Integrated Steel Producers

1. The Algoma Steel Corporation Ltd., Sault Ste. Marie
2. Dominion Foundries and Steel Limited, Hamilton
3. The Steel Company of Canada Ltd., Hamilton

(B) Non-Integrated Steel Producers

4. Atlas Steels Ltd., Welland
(Division of Rio Aglom)
5. Burlington Steel,
Division of Slater Steel Industries Ltd., Hamilton
6. Eastern Steel Casting (IVACO), L'Orignal
7. Lake Ontario Steel Company Ltd., Whitby

(C) Rolling Mills

8. IVACO Rolling Mills, L'Orignal
9. Stanley Steel Co. Ltd., Hamilton

The 1977 annual pig iron production capacities and steel production/processing rates of the above companies are shown in Appendix I.

SUMMARY

Province of Ontario: Iron and Steel Industry Statistics

1. Total number of operations: 9
2. Total estimated current average water intake:
601.3 million Igpd.
- *3. Total estimated current average water discharged:
585.8 million Igpd.
4. Total estimated current slag generation rate:
10,892 tons/day.
5. Total number of blast furnaces: 13
6. Number of individual coke ovens: 878
7. Estimated expenditure on Water Pollution Control Equipment:
(up to 1978) \$154,000,000
8. Estimated number of people employed: 41,700
9. Estimated total loadings to Ontario receiving waters:
 - a) SS 230,464 lbs./day
 - b) Phenols 1,381 lbs./day
 - c) Fe 56,819 lbs./day
 - d) NH₃ (as N) 44,230 lbs./day
 - e) HCN 10,566 lbs./day
 - f) Ether Solubles 18,066 lbs./day

The pH of all the monitored effluents are generally within the requirements of Ontario Industrial Effluent Objectives.

10. Estimated total loadings to individual receiving waters:

	<u>Receiving Waters</u>	<u>SS</u>	<u>Phenols</u>	<u>Fe</u>	<u>NH₃ as N</u>	<u>HCN</u>	<u>Ether Solubles</u>
a)	Burlington Bay/ Lake Ontario	86,620	75	31,321	9,831	156	1,963
b)	Hamilton Harbour/ Lake Ontario	105,940	773	20,976	14,386	2,854	8,435
c)	Welland River/ Niagara River	5,000		1,400			300
d)	St. Mary's River/ Lake Huron	32,589	533	3,015	20,011	7,556	7,368
e)	Lake Ontario (direct discharge)	<315		107		2	
f)	Ottawa River				(Negligible)		
	TOTALS:	<230,464	1,381	56,819	44,230	10,566	18,066

* Discharge Rate lower than intake due to: a) evaporation losses; b) coke quenching operations; c) waste pickle liquor; d) rinse water discharges; d) errors in flow measurement.

DATA SHEETS

ONTARIO

IRON AND STEEL

OPERATIONS

1977 DATA BASE

GENERAL NOTES ON DATA SHEETS

1. Igpd: imperial gallons/day.
2. AVERAGE EFFLUENT QUALITY: Annual Arithmetic Average of Monthly Average Monitoring Results for 1977 - unless otherwise stated.
3. All analytical data in ppm (parts per million) - unless otherwise stated.
4. WATER DISCHARGED: Estimated average over 12 month period. NOT MEASURED REGULARLY. MOST FLOWS ESTIMATED.
5. All analysis are stated on a 'total' basis.
 - Ammonia is expressed as "N"
 - Cyanide is expressed as HCN
6. All data is for 1977 unless otherwise stated.
NOTE: Only complete 1977 data was available at the time of report preparation. 1978 data will be reported when a complete data set has been received.
7. All loadings reported in this document are "gross" loadings.

NAME: THE ALGOMA STEEL CORP. LTD.

ADDRESS: Sault St. Marie, Ontario
P6A 5P2

NO. OF EMPLOYEES: 9,565

CAPACITY: 8,000
(tpd hot metal)

WATER INTAKE: 161,270,000 Igpd.

WATER DISCHARGED: 157,900,000 Igpd. (estimated average)

SLAG PRODUCED: 3069 tons/day

AVERAGE EFFLUENT QUALITY FOR 1977 (ppm)

<u>Sampling Point</u>	<u>pH</u>	<u>SS</u>	<u>Phenols (ppb)</u>	<u>Fe</u>	<u>HCN</u>	<u>NH₃ as N</u>	<u>Ether Solubles</u>
1. Bar & Strip Mill	7.2	16		1.6			
2. Dorr Thickener	8.8	37	96	1.5	3.8	2.6	
3. 60" Blast Furnace Sewer	7.8	13					
4. 30" Blast Furnace Sewer	7.9	8		0.8	0.3		1
5. Tube Division	7.6	13	8	1.8			4
6. 24" Cold Mill Sewer	6.4	15		27.0			11
7. Cold Mill Basin	7.7	2		0.2			2
8. Terminal Basin	8.7	22	518	1.9	6.9	19.6	6

NAME: ATLAS STEEL LTD.

ADDRESS: Centre Street
Welland, Ontario
L3B 5R7

NO. OF EMPLOYEES: 2,200 (approx.)

PRODUCTION: 200,000 tpy specialty steels

WATER INTAKE: (a) 575,000 Igpd from City of Welland
(b) 9,500,000 Igpd from Welland Canal

WATER DISCHARGED: 10,000,000 Igpd

SLAG PRODUCED: 125 tons/day

TYPICAL EFFLUENT ANALYSIS (April 1978)

	<u>ppm</u>	<u>lbs/day</u>
SS	50	5,000
Fe	14	1,400
Ether Solubles	3	300

NAME: BURLINGTON STEEL LTD.
Division of Slater Steel Industries Ltd.

ADDRESS: 319 Sherman Avenue North
Hamilton, Ontario

NO. OF EMPLOYEES: 600

PRODUCTION RATE: 240,000 tpy

WATER INTAKE: 435,000 l/gpd. (city water)

FINAL EFFLUENT: 413,000 l/gpd. (approx.) to city sewers

SLAG PRODUCED: 55 tons/day

EFFLUENT MONITORING: Effluent to sanitary sewer governed
by regional sewer use by-law.

NAME: DOMINION FOUNDRIES & STEEL LTD.

ADDRESS: 1330 Burlington Street East
Hamilton, Ontario
L8N 3J5

NO. OF EMPLOYEES: 11,300

CAPACITY: 9,060
(ingot tpd)

WATER INTAKE: 169,420,000 Igpd.

WATER DISCHARGED: 144,413,000 Igpd. (estimated average)

SLAG PRODUCED: 2,916 tons/day

AVERAGE EFFLUENT QUALITY IN 1977 (ppm)

<u>Sampling Point</u>	<u>pH</u>	<u>SS</u>	<u>Phenols (ppb)</u>	<u>Fe</u>	<u>HCN</u>	<u>NH₃ as N</u>	<u>Ether Solubles</u>
1. Lagoon Overflow	8.2	80	21	8.5	0.20	5	2
2. Cokeplant/ Melt Shop Sewer	7.8	10	89	1.5	0.08	19	1
3. Ottawa St. Sewer	6.8	84	60	56	0.02	5	1
4. Boiler House Sewer	7.8	16	69	3	0.10	6	1

NAME: IVACO INDUSTRIES LTD.
(a) Eastern Steel Casting
(Sivaco Wire & Nail Co. Ltd.)

(b) Ivaco Rolling Mills
(Industrial Fasteners)

ADDRESS: L,Orignal, Ontario
K0B 1K0

CAPACITY: (a) 297,620 tpy melt capacity
(b) 297,620 tpy rolling capacity

WATER INTAKE: 132,000 Igpd.

WATER DISCHARGED: 57,000 Igpd to Mill Creek

SLAG PRODUCED: 39 tons/day

TYPICAL ANALYSIS OF MILL CREEK WATER (1977)

Fe 1 ppm

Zn 0.06 ppm

NAME: LAKE ONTARIO STEEL CO. LTD. (LASCO)

ADDRESS: Hopkins Street South
Whitby, Ontario
L1N 5T1

NO. OF EMPLOYEES: 800

PRODUCTION: 400,000 tpy

WATER INTAKE: 2,100,000 lpd. from town of Whitby

WATER DISCHARGED: 2 lagoons to Lake Ontario

SLAG PRODUCED: 188 tons/day

FINAL EFFLUENT ANALYSIS (March 1978) (ppm)

pH	8.3
SS	<15.0
Cu	0.08
Ni	0.04
Pb	<0.03
Zn	0.10
Fe	5.10
HCN	<0.01
BOD	>16.00
NH ₃ (N)	<0.10
P _T	0.08
NO ₃	0.50
Kjeldahl N	0.40

NOTE: Above analysis based on one sample only

NAME: STANLEY STEEL COMPANY LTD.

ADDRESS: 57 Gerrard Street
Hamilton, Ontario

NO. OF EMPLOYEES: 200

ROLLING RATE: 80 tpd

WATER INTAKE: 105,000 lpd. from city

EFFLUENT: To city sewers

NAME: STEEL COMPANY OF CANADA LTD.

ADDRESS: 100 King Street West
Hamilton, Ontario
L8N 3T1

NO. OF. EMPLOYEES: 17,000 (13,000 in operations
4,000 in support)

CAPACITY: 11,300
(tpd hot metal)

WATER INTAKE: 275,730,000 Igpd.

WATER DISCHARGED: 271,388,680 Igpd.

SLAG PRODUCED: 4,500 tons/day (27% recycled, 62%
sold, 11% disposed)

AVERAGE EFFLUENT QUALITY FOR 1977 (ppm)

<u>Sampling Plant</u>	<u>pH</u>	<u>SS</u>	<u>Phenols (ppb)</u>	<u>Fe</u>	<u>HCN</u>	<u>NH₃N</u>	<u>Ether Solubles</u>
*Outfall No. 1		39.4	534		3.9	5.6	1.3
Outfall No. 2		19.8	721		1.5	1.6	1.2
Outfall No. 3		9.4					2.8
Outfall No. 4	8.0	50.1		13.0		<1.0	11.1
**Outfall No. 5	7.5	73.3	103	20.6	0.1		4.5
Outfall No. 6B	6.0	17.7		11.3			1.5
Outfall No. 7B	3.7	17.4		15.6			1.3
Outfall No. 7C		20.0		2.0			0

NOTES:

1. The effluent quality for BOD and phosphorous are consistently within Ministry objectives.
- *2. Outfall No. 1 receives a minor discharge from International Harvester.
- **3. Combined flow from East Lagoon, East Lagoon Filter Plant and Gage Avenue Storm Water Sewer System monitored at Outfall No. 5.
4. See Appendix VI for Stelco Intake Water Chemical Characteristics.

APPENDIX I

ONTARIO INTEGRATED
AND NON-INTEGRATED
IRON AND STEEL PRODUCTION

APPENDIX I

ONTARIO INTEGRATED AND NON-INTEGRATED
IRON AND STEEL PRODUCTION

	<u>Location</u>	<u>Pig Iron Cap. (tons/year)</u>	<u>Iron and Steel Manufactured/Processed (tons/Year)</u>
A. Integrated Steel Producers			
1. The Algoma Steel Corp. Ltd.	Sault Ste. Marie	2,420,000	2,974,000
2. Dominion Foundries and Steel Ltd.	Hamilton	3,250,000	3,200,000
3. Steel Company of Canada Ltd.	Hamilton	4,200,000	5,600,000
B. Non-Integrated Steel Producers			
1. Atlas Steels Ltd.	Welland	200,000	
2. Burlington Steel Ltd.	Hamilton	240,000	
3. Eastern Steel Casting (Ivaco)	L'Orignal	297,620	
4. Lake Ontario Steel Co. Ltd.	Whitby	400,000	
C. Rolling Mill Only			
1. Ivaco Rolling Mills (Industrial Fasteners)	L'Orignal	297,620	
2. Stanley Steel Co. Ltd.	Hamilton	29,200	
	TOTALS	9,870,000	13,238,440

APPENDIX II

DESCRIPTION

OF

OPERATIONS

APPENDIX II

DESCRIPTION OF OPERATIONS

1. The Algoma Steel Corporation, Ltd., Sault Ste. Marie

This steel complex is located at Sault Ste. Marie near the St. Mary's River. Iron sinter is supplied by the Algoma Ore Division at Wawa and pellets are supplied from U.S. mines at Tilden. Coking of coal is carried out in five batteries of coke ovens (320 ovens). Five blast furnaces and five basic oxygen process furnaces are used for steel manufacture. All liquid effluents are discharged into the St. Mary's River.

In 1977: 3.0 million ingot tons of steel were produced and an average total of 157.9 million Igpd of effluent discharged to the St. Mary's River.

2. Atlas Steel Ltd., Welland

The Welland plant is located near the Welland Canal and produces specialty steels from scrap iron. Six electric arc furnaces are used. The plant has a production capacity of 200,000 tpy and discharges 10,000,000 Igpd effluent into the Welland River.

3. Burlington Steel, a Division of Slater Steel, Hamilton

The plant has a production capacity of 240,000 tpy and discharges 413,000 Igpd of effluent into the city sewers.

4. Dominion Foundries & Steel Limited

The Dominion Foundries & Steel Limited operate a fully integrated steel plant in Hamilton. The iron pellets are supplied by associated mines in Kirkland Lake (Adams Mine) Temagami (Sherman Mine) and Eveleth Mine in the U.S.A. Coking of coal is carried out in two batteries of coke ovens (211 individual ovens). Four blast furnaces and three basic

oxygen process furnaces are utilized to manufacture steel. Liquid industrial effluents are directed to Burlington Bay via a series of industrial sewers and holding lagoons.

In 1977: 3.2 million tons of ingot steel were produced by this company and an average total of 144,413,000 Igpd of effluent was discharged into the Burlington Bay.

5. Eastern Steel Casting, a Division of Sivaco Wire & Nail Co. Ltd., L'Orignal

The company commenced melting operations in 1975 and uses scrap as raw material. There is no liquid industrial effluent discharge from this operation. The melting capacity is 297,620 tons per year.

6. Ivaco Rolling Mills, a Division of Industrial Fasteners, L'Orignal

The plant, a rolling mill, has a capacity of 297,620 tons of rod per year and discharges 57,000 Igpd of effluent to Mill Creek, which finally enters the Ottawa River.

7. Lake Ontario Steel Co. Ltd., Whitby (Lasco)

The Lasco steel mill produces 400,000 tons per year of structural steel shapes and has two 80 ton electric arc furnaces, a continuous billet casting machine and a rolling mill. About 2.1 million gallons per day of cooling water is discharged to Lake Ontario through two settling lagoons.

8. Stanley Steel Co. Ltd., Hamilton

This company operates a rolling mill only, rated at 80 tons per day. Water is consumed at a rate of 105,000 Igpd and discharged to city sewers.

9. Steel Company of Canada, Hamilton

The Steel Company of Canada, Limited, Stelco, is a major steel producer in Canada with an annual production capacity in excess of 6,000,000 tons. Most of the steel is produced and processed at the Hilton Works plant which is located in Hamilton, Ontario. This integrated steelmaking facility employs about 17,000 people and produces a wide range of products including hot and cold rolled plate and sheet steel, galvanized steel, tin plate, and a variety of rod and bar products requiring a variety of rolling processes.

The Hilton Works complex is located on a 920 acre site adjacent to Hamilton Harbour from which about 275,730,000 Imperial gallons of water are drawn daily for circulation through various processes. Selective water treatment is provided before the water is returned to the Harbour from eight main discharge points.

In 1977: 5.6 million ingot tons of steel were produced and an average total of 271,388,680 Igpd of effluent was discharged into Hamilton Harbour.

APPENDIX III

AVERAGE EFFLUENT LOADINGS

ONTARIO STEEL PLANTS

APPENDIX III

AVERAGE EFFLUENT LOADINGS (lbs./day)

ONTARIO STEEL PLANTS

	<u>SS</u>	<u>Phenols</u>	<u>Fe</u>	<u>NH₃ as N</u>	<u>HCN</u>	<u>Ether Solubles</u>	<u>Receiving Waters</u>
1. ALGOMA STEEL	32,589	533	3,015	20,011	7,556	7,368	St. Mary's River - Lake Huron
2. ATLAS STEEL	5,000	-	1,400	-	-	300	Welland River - Niagara River
3. DOFASCO	86,620	75	31,321	9,831	156	1,963	Burlington Bay - Lake Ontario
4. IVACO			NOT ROUTINELY MONITORED				Ottawa River
5. LASCO	<315	-	107	2	-	-	Lake Ontario
6. STELCO	<u>105,940</u>	<u>773</u>	<u>20,976</u>	<u>14,386</u>	<u>2,854</u>	<u>8,435</u>	Hamilton Harbour - Lake Ontario
TOTALS	<230,464	1,381	56,819	44,230	10,566	18,066	

NOTE: For individual detailed average loading summaries
please refer to Appendices IV (a) through IV (f).

APPENDIX IV (a) - (f)

LOADINGS SUMMARIES BY

INDIVIDUAL COMPANY

AND OUTFALLS

APPENDIX IV (a)

ALGOMA STEEL CORP. - AVERAGE LOADINGS SUMMARY (lbs./day)

	<u>SS</u>	<u>Phenols</u>	<u>Fe</u>	<u>NH₃N</u>	<u>HCN</u>	<u>Ether Solubles</u>
1. Bar & Strip Mill Basin	2,640	-	264	-	-	825
2. Thickeners	5,846	15	237	411	600	-
3. 60" Blast Furnace Sewer	1,152	-	-	-	43	144
4. 30" Blast Furnace Sewer	344	-	34	-	13	43
5. Tube Division	247	-	34	-	-	76
6. 24" Cold Mill Sewer	300	-	540	-	-	220
7. Cold Mill Basin	60	-	6	-	-	60
8. Terminal Basin	<u>22,000</u>	<u>518</u>	<u>1,900</u>	<u>19,600</u>	<u>6,900</u>	<u>6,000</u>
TOTALS	32,589	533	3,015	20,011	7,556	7,368

APPENDIX IV (b)

AVERAGE EFFLUENT LOADING ANALYSIS

PLANT: **Atlas Steel**

YEAR: **1978**

EFFLUENT MONITORING POINT: **42" Sewer to Welland River**

ESTIMATED AVERAGE FLOW (Igpd): **10,000,000**

<u>PARAMETER</u>	<u>CONC. (ppm)</u>	<u>LOADINGS (lbs./day)</u>
pH	-	-
SS	50	5,000
Fe	14	1,400
Phenol (ppb)	NM	-
NH ₃ (as N)	NM	-
HCN	NM	-
Ether Solubles	3	300

NM: NOT MONITORED

APPENDIX IV (c)

DOFASCO: AVERAGE LOADINGS SUMMARY (lbs./day)

<u>Effluent</u>	<u>SS</u>	<u>Phenols</u>	<u>Fe</u>	<u>NH₃ as N</u>	<u>HCN</u>	<u>Ether Solubles</u>
1. Lagoon Overflow	41,530	11	4,413	2,596	104	1,038
2. Coke Plant & Melt Shop	1,650	15	248	3,135	13	165
3. Ottawa St. Sewer	38,640	28	25,760	2,300	9	460
4. Boiler House	<u>4,800</u>	<u>21</u>	<u>900</u>	<u>1,800</u>	<u>30</u>	<u>300</u>
TOTAL	86,620	75	31,321	9,831	156	1,963

APPENDIX IV (d)

AVERAGE EFFLUENT LOADING ANALYSIS

PLANT: Ivaco

YEAR: 1977

EFFLUENT MONITORING POINT: Mill Creek

ESTIMATED AVERAGE FLOW (Igpd): 57,000

<u>PARAMETER</u>	<u>CONC. (ppm)</u>	<u>LOADINGS (lbs./day)</u>
pH	-	-
SS	NM	-
Fe	1	1
Phenol (ppb)	NM	-
NH ₃ (as N)	NM	-
HCN	NM	-
Ether Solubles	NM	-

NM: NOT MONITORED

APPENDIX IV (e)

AVERAGE EFFLUENT LOADING ANALYSIS

PLANT: Lasco

YEAR: 1978

EFFLUENT MONITORING POINT: Final plant effluent to Lake Ontario

ESTIMATED AVERAGE FLOW (Igpd): 2,100,000

<u>PARAMETER</u>	<u>CONC. (ppm)</u>	<u>LOADINGS (lbs./day)</u>
pH	8.3	-
SS	<15.0	<315
Fe	5.1	107
Phenol (ppb)	NM	-
NH ₃ (as N)	<0.1	2
HCN	<0.01	-
Ether Solubles	NM	-

NM: NOT MONITORED

APPENDIX IV (f)

STELCO: AVERAGE LOADINGS SUMMARY (lbs./day)

	<u>SS</u>	<u>Fe</u>	<u>Phenols</u>	<u>NH₃ as N</u>	<u>HCN</u>	<u>Ether Solubles</u>
Outfall No. 1	18,912	-	256	2,688	1,872	624
Outfall No. 2	11,880	-	433	960	900	720
Outfall No. 3	4,897	-	-	-	-	1,459
Outfall No. 4	8,066	2,093	-	10,738	-	1,787
Outfall No. 5	59,813	16,810	84	-	82	3,672
Outfall No. 6B	35	23	-	-	-	3
Outfall No. 7B	2,279	2,044	-	-	-	170
Outfall No. 7C	58	6	-	-	-	-
TOTAL	105,940	20,976	773	14,386	2,854	8,435

APPENDIX V

PICKLE

LIQUOR GENERATION

APPENDIX V

PICKLE LIQUOR GENERATION

STEEL PLANTS

<u>ITEM</u>	<u>STELCO</u>	<u>DOFASCO</u>	<u>ALGOMA STEEL</u>	<u>ATLAS STEEL</u>
1) Average estimated tons steel pickled/day	5,500	5,666	1,280	570
2) Average estimated volume pickle liquor/day	58,000 I gals. 5% HCl 21% FeCl_2	66,400 I gals 3% HCl 8.5% Fe^{+2}	10,880 I gals 0.1-0.5% HCl 4-10% Fe	3,200 I gals. 15% H_2SO_4 ; 50% HCl; 14% HNO_3 (mixed with 2% HF)
3) Average estimated volume rinse water	132,000 Igpd	574,000 Igpd	650,000 Igpd	500,000 Igpd
4) Average estimated regeneration scrubber effluent	1,000,000 Igpd	864,000 Igpd	Nil	Nil
5) Disposal	2) to acid regeneration 3) some to Hamilton Harbour 4) to Hamilton Harbour	2) to acid regeneration 4) to Hamilton Harbour. (by end 1979 to be treated in the cold mill waste water treatment plant).	2) to municipal waste treatment 3) to Davignon Creek	2) to Atlas dump 3) to Welland River

APPENDIX VI

STELCO INTAKE WATER
CHEMICAL CHARACTERISTICS
(1977)

APPENDIX VI

STELCO INTAKE WATER CHEMICAL CHARACTERISTICS

<u>Parameter (in ppm)</u>	<u>Bayshore Pumphouse</u>	
	<u>No. 1</u>	<u>No. 2</u>
NH ₃	2.1	1.9
COD	<20.0	<20.0
Cyanide as CN ⁻ (Free)	0.04	0.25
Iron (Total as Fe)	0.55	0.58
Oil (Freon Extractable)	<1.0	<1.0
Phenol (ppb)	8.7	13.0
Suspended Solids	10.0	8.6
pH	8.3	7.9

APPENDIX VII

DOFASCO INTAKE WATER

CHEMICAL CHARACTERISTICS

(1977)

APPENDIX VII

DOFASCO INTAKE WATER CHEMICAL CHARACTERISTICS

Parameter in ppm

pH : 7.8
SS : 11.7
Phenols : 11 ppb
Fe : 2
HCN : 0.016
NH₃ : 4.5
Ether Solubles : 1.6

64 61
7950
EM
428
TD